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WALTER M. DICKIE, M.D., Director

Weekly Bulletin

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Entered as second-class matter February 21, 1922, at the post office at Sacramento, California, under the Act of August 24, 1912.
Acceptance for mailing at special rate of postage provided for in Section 1103, Act of October 3, 1917.

Vol. XV, No. 33 September 12, 1936 GUY P. JONES EDITOR

*The Epidemiology of Tuberculosis**

THE HEALTH OFFICER'S OPPORTUNITY

DR. REGINALD H. SMART, Los Angeles County Health Department

Previous to Koch's discovery of the tubercle bacillus phthisis was generally thought to be caused by a hereditary or acquired diathesis, and therefore not communicable. Even Villemin's brilliant discovery in 1865 that tuberculosis was transmissible from man to animals had failed to impress the majority of the profession until after the isolation of the bacillus in 1882. The proof that Koch's bacillus was the causative agent of tuberculosis did not however convince all physicians of the communicability of this disease.

Several arguments were cited against the theory that tuberculosis was contagious. They were as follows:

(1) The tendency of the disease to run in families, often through several generations, was considered strong evidence of a hereditary predisposition.

(2) It was frequently stated that the employees and attendants of consumptive hospitals did not contract the disease more frequently than the general population. Therefore how could it be transmissible if these persons escaped infection.

(3) The transmission of tuberculosis to the marital partner was said to be no more frequent than would be explained on the basis of coincidence or "assortive mating."

Even as late as 1920 so eminent an authority as Bushnell made this statement: "primary tuberculosis acts like an infectious disease but chronic phthisis does not" and again he stated "consumption is not infectious for those who already have a tuberculous infection, even though it be occult." He and many others held the view that all adults living in civilized countries had been infected with tubercle bacilli and whether or not this infection should develop into manifest disease would be governed by only two factors: the size of the initial infection and the resistance of the individual. In other words, they believed that chronic phthisis is not caused by an exogenous superinfection, but is the result of a break down or extension of the original focus. Bushnell went so far as to state that reinfections from without could not occur as long as the body harbored the original infectious agent—in the same way that the syphilitic patient is protected from a second chancre until his disease is cured.

Studies in the epidemiology of tuberculosis made during the past twenty years have thrown additional light upon these problems of exogenous versus endogenous reinfection and the contagion of tuberculosis. These recent investigations have been more fruitful than earlier studies largely because they took cognizance of two peculiarities of tuberculosis; namely, the tendency of the disease to remain latent and thereby unrecognized for long periods of time, even years, and the variable and often prolonged incubation period of tuberculosis. These difficulties have been partly overcome by the routine use of the intracutaneous tuberculin test in conjunction with the X-ray and by a systematic long time follow-up of the groups under observation.

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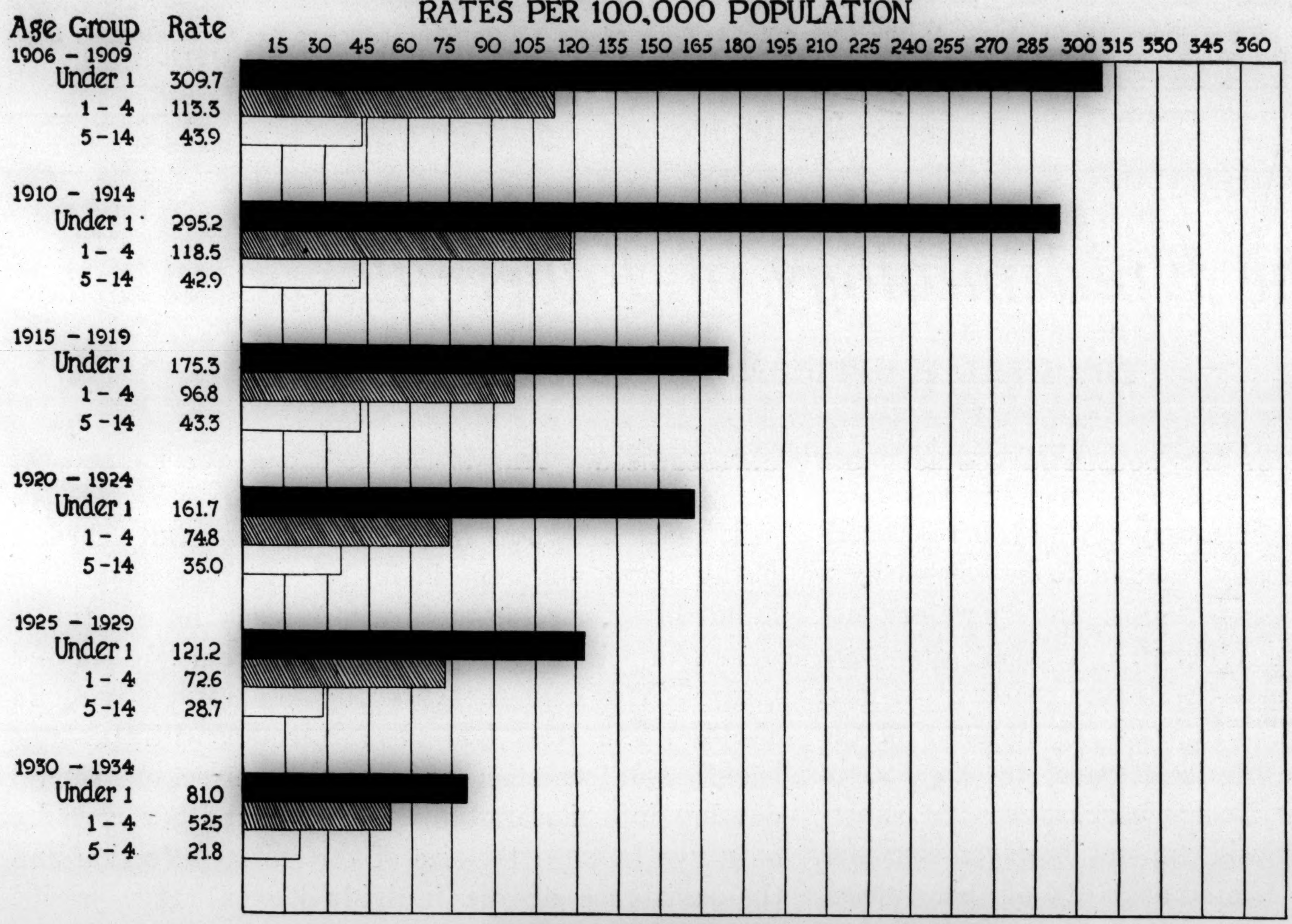
* Read before the Health Officers' Section, League of California Municipalities, Santa Monica, September 10, 1936.

When the tuberculin test and the Roentgenogram are used in the study of households harboring a person with tuberculosis many of the presumably well members are found to have latent lesions that are a serious threat to future health. These latent lesions may not become manifest clinical disease until years later and hence the great importance of a prolonged period of observation.

Opie and his coworkers have recently reported on the results of their study over a period of eight years of the spread of tuberculosis in 1000 white families. They conclude that “the spread of tuberculosis occurs in large part by long drawn out family or household epidemics in which the disease is slowly transmitted from one generation to the next. Pulmonary tuberculosis of the adult type is not the continuation of tuberculosis of childhood, but is an exogenous infection acquired in adolescence or adult life.”

MORTALITY UNDER 15 YEARS OF AGE FROM TUBERCULOSIS,
BY AGE GROUPS — 1906 to 1934
RATES PER 100,000 POPULATION



TUBERCULOSIS

Those opposing the view of exogenous infection of adults often base their contention upon the report from the Brompton Hospital for consumptives in England. This report maintained that those employed in the hospital were not more likely to develop tuberculosis than outsiders. Cobbett, in analyzing this report, has pointed out that certain employees, as the porters who cared for the sputum pots, did develop tuberculosis in relatively large numbers. It should also be remembered that the methods of examination in use at that time could not reveal the true amount of disease present among the employees. Likewise the period of follow-up was too short for a disease as chronic as tuberculosis.

There have been many reports in recent years on the occurrence of tuberculosis among students of medicine and nursing. When tuberculin tests and chest roentgenograms are used nearly all investigators have found a greater prevalence of both tuberculous infection and disease among these persons than in other students of same age and economic status. Here again the risk of contracting tuberculosis varies directly with the number of bacilli in the environment and indirectly with the precautions taken to prevent the dissemination of these bacilli.

Concerning marital tuberculosis Opie and McPhedran have shown that “when roentgenographic methods are used for the recognition of tuberculous lesions of the lungs in husbands and wives in contact with a tuberculous partner, that exogenous infection of adults is clearly demonstrated; the husbands and wives in marital contact being infected from five to nine times as often as in persons with no known contact.”

From the foregoing discussion it can be seen that painstaking present day studies leave no doubt as to the contagiousness of tuberculosis. What are the implications of this fact for the health officer? He can no longer consider tuberculosis as apart from other communicable diseases simply because it is apt to have a prolonged incubation period, an insidious onset or a long period of latency. Despite a reduction of nearly 75 per cent in the mortality from this disease since 1900 tuberculosis is still the most prevalent cause of illness and death in persons between the ages of 15 and 40. Consequently it continues to be one of our most important public health problems. Although we lack a specific cure for this disease we know enough about its prevention to enable us to reduce it to a minor cause of death in the near future. How is this to be done? We must attack tuberculosis from the epidemiological standpoint. Experts are of the opinion that we can expect little additional progress in the eradication of tuberculosis from the application of general sanitary and hygienic measures. The attack of the future must be along specific preventive lines. We must deal with tuberculosis as with other communicable diseases. When a patient is found to have this disease he must be prevented from further disseminating his infection through appropriate isolation, treatment and education. All of the household contacts and intimate associates must be carefully examined for evidence of infection and latent disease. This must be done not in a perfunctory manner, but by means of tuberculin tests and roentgenograms. There must be adequate follow-up and supervision of these contacts.

Two questions regarding every patient's disease should be carefully answered—"From whom did he get it; to whom has he given it?"

The vigilant health officer will not be content, however, with the supervision of known tuberculous patients and their contacts. He must realize that the majority of persons who develop tuberculosis, if left to their own initiative, do not get a diagnosis until the disease is in an advanced stage. This is a tragic occurrence, since it means the patient has a much poorer chance of recovery and has more likely transmitted his infection to his associates.

Early diagnosis occupies a key position in the anti-tuberculosis crusade and consequently "case-finding" programs have been developed. As the name implies, we must actually look for persons with early tuberculosis, utilizing modern diagnostic methods and our knowledge of the epidemiology of the disease. This knowledge will direct our efforts toward those places in the community where tuberculosis is more likely to be found. The following groups have been found a fruitful field for case-finding work: known contacts to present or past cases of tuberculosis; adolescent children and young adults; certain racial groups as the colored, the Mexican, the American Indian and the Japanese. Persons of poor economic status and low standard of personal and family hygiene are more prone to this ailment. Other groups likely to have tuberculosis are those employed in industries involving exposure to silica dust, students of medicine and nursing, patients with diabetes, pregnant women and patients consulting physicians.

In the past ten years there has developed a nation-wide program of tuberculosis surveys in the public schools and colleges. These programs accomplish several purposes:

They are a potent method of health education and many children are prevented from developing tuberculosis in the future by timely observation and supervision.

They are a means of finding children and young adults who have latent and manifest tuberculosis. More than this, if we search for the source of infection of those children who have only a positive tuberculin test we can often find a person in the home or school who has tuberculosis that was previously unrecognized. This is one of the newer methods of case finding; the positive skin tests of the children are the clues that lead to the grown-ups who are acting as foci of infection.

Teachers have been known to infect school children. An ominous fact is that reports from various sections of the United States indicate that nearly two per cent of school teachers have tuberculous disease.

No discussion of the spread of tuberculosis is complete without mention of the bovine tuberculosis problem. Great strides have been made in eradicating tuberculous cattle in the United States as a whole. There are now forty states that are modified accredited areas. Unfortunately California is not one of these states; in fact, there is more bovine tuberculosis in California than in all the other states combined. This should be a matter of great embarrassment to us and all health minded people should lend their efforts to the correction of this deplorable situation.

As the control of tuberculosis has proceeded and become more effective, not only have the mortality and morbidity rates fallen, but likewise the incidence of tuberculous infection is substantially lower. There are large areas in this country where not more than 50 per cent of young adults react positively to accurate tuberculin tests. In Los Angeles County the percentage of elementary, junior high and high school pupils reacting positively to two doses of the purified protein derivative tuberculin was 25 per cent, 30 per cent and 41 per cent, respectively. This declining incidence of tuberculous infection means that the intra-cutaneous tuberculin test is becoming more and more valuable both as a diagnostic test and an epidemiological procedure.

Since future efforts to eradicate tuberculosis must be directed more and more along epidemiological lines it is the health officer who should lead his community in this direction. He above all others has the necessary interest and skill in epidemiological technique. This interest and knowledge he must impart to all who are concerned in the control of this dread scourge, whether it be the private physician, the social and welfare worker, the public health worker, the tuberculous patient or the average citizen.

MORBIDITY

Complete Reports for Following Diseases for Week Ending September 5, 1936

Chickenpox

33 cases: Hayward 1, Oakland 4, Angels Camp 1, Los Angeles County 5, Los Angeles 4, San Rafael 1, San Diego County 3, Oceanside 1, San Diego 1, San Francisco 9, San Joaquin County 1, Manteca 1, Santa Barbara County 1.

Diphtheria

31 cases: Berkeley 1, Brawley 1, Hanford 1, Los Angeles County 2, Azusa 1, Los Angeles 10, Sacramento 1, San Diego 2, San Francisco 1, San Joaquin County 1, Redwood City 1, Santa Barbara 1, Santa Clara County 6, Mountain View 1, San Jose 1.

German Measles

16 cases: Berkeley 2, Oakland 1, Los Angeles County 5, Los Angeles 1, Anaheim 1, San Francisco 1, Burlingame 1, Santa Barbara County 1, Vallejo 3.

Influenza

13 cases: Berkeley 2, Arcadia 1, Glendale 2, Los Angeles 8.

Malaria

7 cases: Los Angeles 1, Yuba County 4, California 2.*

Measles

20 cases: Contra Costa County 4, Los Angeles County 1, Los Angeles 3, Redondo 1, Sacramento 1, Redlands 1, San Francisco 4, San Mateo County 2, Santa Cruz County 1, Sonoma County 1, Ventura County 1.

Mumps

128 cases: Alameda County 1, Berkeley 5, Oakland 3, Los Angeles County 16, Alhambra 4, Avalon 1, Burbank 1, Culver City 2, El Monte 1, Glendale 2, Huntington Park 2, Long Beach 1, Los Angeles 20, Pomona 1, San Rafael 1, Mono County 2, Orange County 1, Brea 2, Santa Ana 8, Placentia 4, Riverside County 3, Corona 4, Sacramento 5, San Diego County 3, Chula Vista 1, San Diego 3, San Francisco 4, Stockton 1, Santa Barbara County 2, Santa Barbara 5, Watsonville 6, Fillmore 8, Yolo County 1, Woodland 4.

Pneumonia (Lobar)

21 cases: Berkeley 1, Humboldt County 1, Los Angeles County 1, Glendale 2, Los Angeles 11, San Bernardino 1, Oceanside 1, San Francisco 2, Santa Barbara 1.

Scarlet Fever

75 cases: Berkeley 1, Hayward 1, Oakland 1, El Dorado County 2, Fresno 1, Humboldt County 1, Kern County 1, Bakersfield 1, Los Angeles County 2, El Monte 1, Glendale 1, Long Beach 1, Los Angeles 6, Pasadena 1, San Fernando 2, Santa Monica 3, Madera 1, Marin County 1, Sausalito 1, Merced County 1, Merced 1, Brea 1, Riverside County 1, Sacramento 7, San Bernardino 1, San Diego 2, San Francisco 14, Lodi 1, Stockton 1, Tracy 1, Santa Barbara 1, Sannta Clara County 1, Gilroy 2, Los Gatos 1, Santa Clara 1, Santa Cruz County 1, Suisun 5, Sonoma County 2, California 1.*

Typhoid Fever

21 cases: Alameda County 1, Oakland 3, Imperial County 1, Los Angeles County 1, Los Angeles 2, San Bernardino 3, San Francisco 2, San Joaquin County 2, Solano County 1, Tulare County 1, California 4.*

Whooping Cough

242 cases: Alameda County 2, Alameda 2, Berkeley 13, Oakland 6, Contra Costa County 2, Humboldt County 1, Los Angeles County 21, Beverly Hills 2, Glendale 1, Huntington Park 1, Long Beach 2, Los Angeles 48, Montebello 1, Pasadena 7, Pomona 1, San Gabriel 3, Santa Monica 1, Vernon 1, Anaheim 1, Santa Ana 7, Placentia 7, Tustin 1, Riverside County 10, Corona 1, Sacramento 27, San Bernardino 4, San Diego County 16, National City 2, San Diego 11, San Francisco 27, Stockton 5, San Mateo County 2, Santa Barbara County 3, Yolo County 2, Woodland 1.

Anthrax

One case: Glendale.

Meningitis (Epidemic)

3 cases: Los Angeles 1, Sacramento 1, San Joaquin County 1.

Dysentery (Amoebic)

4 cases: Los Angeles 2, Tracy 1, Santa Barbara 1.

Dysentery (Bacillary)

6 cases: Fresno County 4, Los Angeles County 1, Santa Ana 1.

Pellagra

2 cases: Oakland 1, Los Angeles 1.

Poliomyelitis

26 cases: Oakland 1, Fresno 1, Kern County 1, Los Angeles County 2, Alhambra 1, Beverly Hills 1, Los Angeles 11, Pasadena 1, San Gabriel 1, King City 1, Sacramento County 1, San Francisco 1, Santa Barbara County 1, Tulare County 1, Tulare 1.

Tetanus

One case: San Gabriel.

Encephalitis (Epidemic)

One case: Fresno County.

Paratyphoid Fever

2 cases: Fresno County 1, Bell 1.

Food Poisoning

10 cases: Los Angeles 6, San Diego 3, San Francisco 1.

Undulant Fever

7 cases: Kern County 1, Los Angeles County 1, Huntington Park 1, Long Beach 1, Whittier 1, San Jose 1, Tulare County 1.

Rabies (Animal)

7 cases: Los Angeles County 1, Los Angeles 1, Manhattan Beach 1, San Bernardino 4.

Coccidioidal Granuloma

2 cases: Los Angeles.

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* Cases charged to "California" represent patients ill before entering the state or those who contracted their illness traveling about the state throughout the incubation period of the disease. These cases are not chargeable to any one locality.

When you enter the laboratory, put off your imagination as you would your coat. When you leave your laboratory, put it on again. Let your imagination wrap you around before the experiment and between whiles; put it away during the working hours, however, lest it hinder your power of observation.—Claude Bernard.

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